that it seemed as though thousands of needles were pricking them as the storm passed. It should be noted that as these storms occurred after dark, there was a very favorable opportunity for observing lightning, but not for noting other phenomena of these violent storms. Several spoke of observing the funnel cloud by the light of the vivid flashes of lightning.

INLAND NAVIGATION.

STAGE OF WATER IN RIVERS.

The following table shows the danger point and the highest and lowest stages for the month of September, 1894:

Heights of rivers above low-water mark, September, 1894.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
Red River.	*Feet.*	*Feet.*		*Feet.*		*Feet.*
Shreveport, La.	29.2	— 2.5	1, 29	— 3.7	10	1.2
Arkansas River.						
Fort Smith, Ark.	22.0	11.3	16	0.7	1	10.6
Little Rock, Ark.	23.0	9.8	18	2.9	3, 4	6.9
Missouri River.						
Bismarck, N. Dak.	75.0					
Pierre, S. Dak.*	13.0	2.2	1	1.8	21, 22	0.4
Sioux City, Iowa	18.7	7.7	1	6.1	28, 29	1.6
Omaha, Nebr.	18.0	8.2	1	6.6	30	1.6
Kansas City, Mo.	21.0	9.7	3	6.7	29, 30	3.0
Mississippi River.						
St. Paul, Minn.	14.0	1.9	16–18	1.4	2	0.5
La Crosse, Wis.	10.0	1.3	23–27	0.9	5, 6, 14–19	0.4
Dubuque, Iowa.	16.0					
Davenport, Iowa.	15.0	1.6	11, 12	0.1	1–7	0.5
Keokuk, Iowa.	14.0	1.9	24	— 0.7	1–3	2.6
Hannibal, Mo.	17.0	2.6	25	— 0.2	1–3	2.8
St. Louis, Mo.	30.0	6.1	18	3.4	3, 4	2.7
Cairo, Ill.	40.0	6.4	21	5.1	5	1.3
Memphis, Tenn.	33.0	1.9	1	1.0	8, 9	0.9
Vicksburg, Miss.	41.0	2.2	28, 29	—0.2	14	2.4
New Orleans, La.	13.0	4.2	20, 21	3.0	1, 2	1.2
Ohio River.						
Parkersburg, W. Va.	38.0	12.4	23	0.3	10, 11	12.1
Cincinnati, Ohio	45.0	13.0	27	3.1	14, 15	9.9
Louisville, Ky.	24.0	6.7	29	2.6	18–20	4.1

Heights of rivers—Continued.

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Height.	Date.	Height.	Date.	
Cumberland River.	*Feet.*	*Feet.*		*Feet.*		*Feet.*
Nashville, Tenn.	40.0	1.7	18, 20	0.4	28–30	1.3
Tennessee River.						
Chattanooga, Tenn.	33.0	4.0	1	0.8	30	3.2
Knoxville, Tenn.	29.0					
Monongahela River.						
Pittsburg, Pa.	22.0	10.6	21	2.0	28	8.6
Savannah River.						
Augusta, Ga.	32.6	13.7	19	5.0	13	8.7
Willamette River.						
Portland, Oregon	15.0	6.3	2	2.2	24	4.1
Susquehanna River.						
Harrisburg, Pa.	17.0					
Alabama River.						
Montgomery, Ala.	48.0	4.7	22	0.0	7	4.7
James River.						
Lynchburg, Va.	18.0	1.5	1, 30	—0.2	13–18	1.7
Sacramento River.						
Red Bluff, Cal.	22.0	1.2	30	0.6	23–25	0.6
Sacramento, Cal.	25.0	8.2	1, 2	7.5	13–30	0.7
Des Moines River.						
Des Moines, Iowa.	19.0	4.0	9	2.8	10, 11, 14–19, 26–28.	1.2

*Record for 22 days.

The above table shows that no floods occurred during the month in the rivers therein tabulated. In most cases the rivers were unusually low.

ATMOSPHERIC ELECTRICITY.

GENERAL STATISTICS.

The table showing in detail for September, 1894, the statistics relative to auroras and thunderstorms is placed among the meteorological tables as No. XI, instead of being given in the text as heretofore. It shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month. It is not certain that all the meteorological stations are equally faithful in reporting thunderstorms and auroras, and it is therefore necessary for the student to guard against the assumption that the frequency of these phenomena varies with the number of the reports. Even if the number of reports be divided by the number of stations in each State, the percentages of frequency thus obtained are liable to a similar uncertainty, and therefore for the present such percentages are omitted.

In comparing the relative frequency of thunderstorms or auroras in different portions of the globe and at different seasons of the year it is customary, and, in fact, imperative, to ignore the number of stations and the number of reports as such and to consider only the number of days on which the phenomena occur. In such studies, therefore, the number of stations is of importance principally as an indication of the probability that all of the thunderstorms and auroras have been recorded. Even from this point of view, however, it is necessary to know not merely the number of stations, but their geographical distribution within each State as an assurance against overlooking any very local phenomena that might have occurred only in the regions where no observer was at hand. Owing to the want of space in Table XI, the publication of the necessary data here referred to will be delayed until the annual summary.

THUNDERSTORMS.

A mention of the more severe thunderstorms reported during the month is given under "Local storms." The dates on which reports of thunderstorms were most numerous were: 8th, 181; 10th, 171; 5th, 138; 9th, 134; 14th, 121; 7th, 106.

The States where thunderstorm reports were most numerous were: Missouri, Pennsylvania, Ohio, Iowa, Kansas, Florida, and Illinois.

The States where the dates of thunderstorms were most frequent were: Florida, where they were recorded on 23 days; Missouri, on 22 days; Kansas and Michigan, on 20 days.

DAMAGE BY LIGHTNING.

The following statistics of the damage done by lightning in September, so far as reported by the observers of this Bureau, are furnished by Mr. Alexander McAdie:

During September, 1894, 29 persons were killed and 14 severely injured; 56 barns were struck, with a loss of not less than $141,350; 42 dwelling houses were struck and a number of churches, several schoolhouses, 1 armory, and 1 railroad depot.

AURORAS.

The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four days preceding and following the date of full moon, viz, from the 10th to the 18th, inclusive. On the remaining twenty-one days of the month 243 reports were received, or an average of 12 per day. The dates on which the reported number especially exceeded this average were the 27th, 73;

14th, 43; 19th, 27. The States from which auroras were reported by a large percentage of observers were: North Dakota, Minnesota, and Wisconsin.

The States where the dates of auroras were most frequent were: Minnesota, 14; North Dakota, 12; Wisconsin, 10.

CANADIAN DATA—THUNDERSTORMS AND AURORAS.

Thunderstorms were reported as follows: 1st, Swift Current and Qu'Appelle, Assin. 2d, Minnedosa, Man.; White River, Parry Sound and Toronto, Ont. 3d, Qu'Appelle, Assin., and Quebec, Que. 4–5th, Toronto, Ont. 5th, Winnipeg, Man. 6th, Minnedosa and Winnipeg, Man.; Halifax, N. S.; and Grand Manan, N. B. 7th, Port Stanley, Ont. 8th, Edmonton, Alberta, Port Stanley and Toronto, Ont., and Montreal, Que. 10th, Toronto and Kingston, Ont. 13th, Minnedosa, Man., and Toronto, Ont. 15th, Minnedosa, Man.; Parry Sound and Toronto, Ont. 20th, Montreal and Quebec, Que. 23d, Parry Sound, Ont., and Father Point, Que. 26th, Minnedosa, Man. 30th, Minnedosa, Man., and Toronto, Ont.

Auroras were reported as follows: 2d, Father Point, Que. 2d, Minnedosa, Man. 5th, White River, Ont. 10th, Prince Albert, Sask.; Medicine Hat, Assin., and Minnedosa, Man. 11th, Port Arthur, Ont., and Quebec, Que. 12th, Minnedosa, Man. 14th, Saugeen, Parry Sound, and Port Stanley, Ont., and Halifax, N. S. 15th, White River and Toronto, Ont. 18th, Medicine Hat, Assin. 21st, Kingston, Ont., and Halifax, N. S. 22d and 25th, Father Point and Quebec, Que. 26th, Quebec, Que. 27th, Toronto, Ont., and Montreal and Quebec, Que. 29th, Medicine Hat, Assin. 30th, Father Point, Que.

STATE WEATHER SERVICES.

A tabular summary of the more prominent climatological features of each State and Territory, as given in the reports for September by the directors of the respective State Weather Services, is presented in Table XII. This table gives for the whole area of any State: (*a*) the average departure from the normal values of the current monthly mean temperatures and total precipitations; (*b*) the maximum and minimum temperatures and precipitations; (*c*) the greatest and least monthly ranges of temperature occurring anywhere within the State. This table is essentially a summary of Table II, and therefore presents a somewhat different study of meteorological conditions from that given in Table I, which is based on regular Weather Bureau stations arranged in so-called climatic districts.

The following extracts are taken from the reviews published by the respective services; occasional notes in brackets are added by the Editor:

California.—The observer at Los Alamos notes that the rainfall of 1.81 inch means a great deal to the stock men of the valley, but will ruin more or less of the bean crop. At several stations in California snow was observed on the Sierra Nevada Mountains on the 29th and 30th, being the earliest known for many years. In southern California the rain and snow of the 29th and 30th was unprecedented and caused much injury to hay, grape, and other crops.

Florida.—The greater part of the remarkably heavy rainfall in eastern Florida fell on the 22d–26th, inclusive, during the progress of the West Indian hurricane; there was a deficiency of rainfall in the western portion of the State; considerable damage was done to the orange and other crops, both by the rain and the wind.

Indiana.—The weather conditions, especially the rain, were more favorable to crops, pasturage, and farm work than in the preceding months. Corn matured rapidly, pasturage turned fresh and green again. At Vevay the Ohio River reached the lowest stage on record. The general reports indicate excellent crops.

Iowa.—The weather was generally very favorable for farm work and the maturing of crops. The tornadoes and thunderstorms of the 20th and 21st, with severe hail, were the most destructive of this year in the West. [A full account of these is given in the Iowa Monthly Review and a condensed account by Professor Hazen will be found in the present publication.] The drought of August was broken by the general rain of the 26th, but at the close of the month the wells, streams, and springs continued to be very low or dry, showing that the subsoil was not yet saturated. The smoky condition of the atmosphere continued from August until the 3d of September. [The Iowa Review gives a list of severe or so-called historical droughts in the Middle States since 1634. A similar list, but differing in details, has been published in some New England papers. Any observer who can give additions or corrections to these lists will confer a favor by communicating with the Chief of the Weather Bureau.]

Maryland.—The drought of August was broken by the general rain beginning on the 5th and 6th and closing on the 9th, in consequence of which all agricultural conditions were greatly improved.

Michigan.—The corn crop was badly injured by the drought; it was generally cut between the 1st and 20th; it ripened early with a small yield of grain which was of good quality and a rather small yield of fodder. Very little of it was injured by the frost of the latter part of the month. The observer in St. Clair County reports only one rain during July, August, and September.

Minnesota.—Forest fires on the 1st and 2d in the east-central portion of the State killed over 400 people. These fires continued throughout the greater portion of the month, spreading into the meadows, where they burned the hay and grain, and the atmosphere over the State continued very smoky. Light rains occurred at many isolated localities, and finally a general rain on the 13th and 14th relieved the drought. Harvest work progressed satisfactorily; the yields of small grain were better than expected. [The great drought is generally spoken of as having lasted four months, viz, from May 15 to September 14, but this is not to be understood as meaning that no rain fell during this interval.]

Mississippi.—The monthly report states that this has been a seasonable month and highly satisfactory from an agricultural point of view.

Missouri.—The weather conditions were especially favorable to the farmer. The severe drought of July and August was broken by rain in the early part of the month.

Nebraska.—The weather continued warm and dry during the month and without great extremes of temperature, as compared with previous years.

Nevada.—Temperature much above the normal, averaging 3° for the State, and accompanied by numerous killing frosts. Precipitation was also below the normal, but the snowfall was unusual as to amount and extent.

New England.—The average temperature for 21 stations shows the month to have been about 2° warmer than the normal, but Eastport, Me., gives a local deficit of 3.6. General frosts occurred on two occasions. The drought of the summer was broken by heavy rain on the 10th in the central districts, and by a general rain on the 19th and 20th, but springs and wells still remain low. Smoke prevailed during the first ten days of the month and was so thick on the afternoon of the 2d that the sun could be looked at with the naked eye.

North Dakota.—The month was about the average in every respect. A remarkable electric display occurred on the night of the 6th in connection with the storm.

Ohio.—The weather was very favorable for the plowing and seeding of wheat and barley. The drought was generally broken about the middle of the month.

Oklahoma.—No unusual meteorological conditions, except hot winds on the 7th and 8th over the western half of the Territory; the maximum temperatures were 109 to 107 at Anadarko and other stations on the 7th.

Pennsylvania.—The drought damaged the crops in all parts of the State, but was broken by general rains on the 8th.

South Carolina.—The heavy wind and rain of the 26–28th beat standing crops to the ground; about 10 per cent of the cotton, rice, and peas that were still in the field were seriously damaged.

South Dakota.—The weather was generally favorable for late haying.

Tennessee.—Dry and warm weather and an abnormal amount of sunshine characterized this month; this was favorable for saving matured crops, but was injurious to late crops and retarded the preparation of the land for fall seeding.

Washington.—This was the coolest and wettest September in the last five years. On the whole the month was favorable to agriculture; the grain crops were nearly all gathered; the hop crop not as good as might have been desired.